



## PIPE COUPLING

### FIELD OF THE INVENTION

The present invention relates to pipe couplings of the type adapted to sealingly connect a pipe to a flange of a vessel or the like, or to connect two  
5 ends of pipes extending co-axially one with respect to the other.

### BACKGROUND OF THE INVENTION

The most popular pipe coupling presently used for the above purposes is of the type known as hingeable split collar. It comprises a matched pair of half-circular collars hinged to each other at one end and provided with lugs at  
10 the other end. The collars are formed with rims or shoulders adapted to fit into and hold against complementary circumferential grooves formed near the ends of the pipes. An elastomeric circular gasket is used, surrounding the space between and partly extending over the pipe ends. Once the collars are tightened to each other, by a bolt passing through the respective lugs overlying  
15 each other, the gasket becomes compressed to provide a seal between the pipes.

Pressure admitted into the pipes is effective to enhance the sealing effect by further pressurizing of the gasket against the rims of the collars.

These split collar couplings are inherently inconvenient for use, demanding  
20 certain manipulation and application of physical force during the initial mounting stage.

Other deficiencies of the conventional couplings are that they need to be made of metal, and hence they are heavy and wasteful in terms of storage and transportation space.

It is the prime object of the present invention to provide a pipe coupling of  
5 simple, plastic molded integral construction, and allowing a wide range of variations satisfying different pipe-work conditions.

It is a further object of the invention to make use of the standard grooved pipe ends as applied in conjunction with the split collar couplings.

### **SUMMARY OF THE INVENTION**

10 Provided according to the invention is a pipe coupling for connecting a pipe to a flange associated with another pipe in a sealed manner, wherein the pipe is formed with a circumferential groove the coupling comprising a gasket, a mounting ring, and a mounting flange, c h a r a c t e r i z e d in that the ring is elastically expandable, and formed with projection means adapted to fit into  
15 the groove and hold the ring affixed to the pipe while the mounting flange is tightened against both the ring and a counter-flange.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

These and additional constructional features and advantages of the invention will be more clearly understood in the light of the ensuing description  
20 of several preferred embodiments thereof, given by way of example only with reference to the accompanying drawings, wherein -

Fig. 1 is a cross-sectional view of a pipe coupling featuring the characteristics of the present invention as used for connecting a pipe to an outlet/inlet flange of a fluid vessel;

Fig. 2 shows a detail of the coupling of Fig. 1 on an enlarged scale;

5 Fig. 3 is a sectional view taken along line III-III of Fig. 1;

Fig. 4 is a sectional view taken along line IV-IV of Fig. 1;

Fig. 5 is a perspective exploded view of the pipe coupling of Fig. 1;

Fig. 6 is a cross-sectional view of a pipe coupling according to another embodiment of the invention used for connecting together a pair of pipes;

10 Fig. 7 shows a detail of the coupling of Fig. 6 on an enlarged scale;

Fig. 8 illustrates a modified elastomeric gasket;

Fig. 9 illustrates a modified mounting split ring;

Fig. 10 illustrates a further modification of the mounting split ring;

Fig. 11 is a modification of the ring of Fig. 10;

15 Fig. 12 is a perspective view of a mounting ring of a hybrid, multi-segment structure;

Fig. 13 is a top view of ring of Fig. 12;

Fig. 14 is a sectional view taken along line XIV-XIV of Fig. 13; and

Fig. 15 shows a mounting split ring worked out of sheet metal.

## 20 **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring to Figs. 1-5, there is shown a pipe 10 coupled to a flange 12 by a series of bolts 14. The flange 12 may be welded or otherwise form part of, for example, a fluid vessel (not shown) via a pipe section 16.

The coupling comprises three parts: a split mounting ring 18; an elastomeric gasket ring 20; and a mounting flange 22.

As more clearly seen in Figs. 2 and 5, the pipe 10 is formed with a circumferential groove 10a similar to that used in connection with the conventional hingeable collar couplings.

The split mounting ring 18 is typically made of plastics, and formed with a circular rib 18a configured to fit into the groove 10a.

The rib 18a is preferably of a generally saw-tooth shape (see Fig. 2), whereby the leading side 18a' thereof exactly matches the right angled side wall of the groove 10a while at the opposite side 18a" it is beveled as shown, for a reason to be explained further below.

The ring 18 is further formed with a circular recess 18b for snugly receiving gasket 20.

The outer contour of the ring 18 has a cone-shape surface 18c, preferably between 15° and 30°, merging with an upright shoulder 18d.

Finally, the ring 18 is split by a cut 18e, for enabling the spreading or expansion thereof to an extent allowing it to be forced over the open side of the pipe 10 and pushed further until the rib 18a clicks into the groove 10a.

The gasket 20, usually of rubber or other suitable elastomeric material, is preferably formed with an inner slot 20a for its expansion under the pressure of the flowing through liquid as known in the art ("hydraulic seal").

The mounting flange 22 has an inner cone-shaped surface 22a of the same inclination and length as of the surface 18c of the ring 18, so that when

the bolts 14 are tightened, a firm grip around the ring 18 is achieved along with an axially directed force component acting against the shoulder 18d, as requested for sealing the gasket 20 against the face of the flange 12 in the assembled position of the coupling.

5        The flange 22, with bores 22b for the bolts 14, is preferably formed with arcuate projections 22c compensating the width of the shoulder 18c.

      The manner of assembling the coupling is self-evident in view of the foregoing description. As seen in Fig. 5, the flange 22 is first placed over the pipe 10. Then the mounting split ring 18 is forcibly dressed over the end of the  
10    pipe, which is facilitated by the elastic expansion assisted by the beveled portion 18a" of the rib 18a.

      Once properly seated over the pipe 10, namely that the rib 18a grips around the groove (10a), the gasket 20 is placed into the recess 18b, and the flange 22 is dragged over the ring 18 in the direction of the flange 12 to which  
15    it is intended to be fastened.

      The counter-force requested to withstand the tightening of the flanges 12 and 22 to each other using the bolts 14, thereby squeezing of the gasket 20 to a proper amount, is offered by the rib 18a trapped within the groove 10a, or, more accurately, the abutment of the portion 18a' against the upright wall of  
20    the groove 10a.

      The coupling substantially as so far described is readily useful for connecting two pipes of equal (or even unequal) diameters, as depicted in Figs.

6 and 7, where similar reference numerals are used to denote already identified parts and components.

As clearly seen, two couplings are employed, in a "face-to-face" engaging relationship. Hence, the left-hand side pipe 110 is assembled with mounting  
5 split ring 118, gasket 120 and mounting flange 122, which is tightened to flange 222, surrounding split ring 218 and gasket 220 (rather than to the fixed flange 12 as in the previous embodiment). Thus, the pipe 110 becomes sealingly connected to the pipe 210.

Several modified embodiments will be now described, demonstrating the  
10 versatility and other advantages of the present invention.

Referring to Fig. 8, there is exemplified a gasket 320 provided with a thin flap or tongue 320b designed to be inserted into slot 318e of the split ring 318. The positioning of the flap between the ring sections will add some flexibility that will compensate for any deviation of measurement or surface irregularities  
15 between the ring and the surrounding mounting flange (not shown), allowing less stringent tolerance control during production.

The mounting split ring 418 of Fig. 9 is formed with a cut-through slot 418e extending at an angle with respect to axial direction.

Rather than employing a split ring, it is possible to have it composed of  
20 more than one segment (two in Fig. 10 and three in Fig. 11), held together by a rubber band (524 and 624, respectively).

The mounting ring 718 of Figs. 12-14 is again of a modified design. A series of metal inserts 726 are positioned between the segments. An elastic

band 728 is threaded through all segments and inserts enabling the expansion of the ring 718 as requested for the mounting thereof over a pipe (not shown). The inserts conform the shape of the mounting ring as dictated for its use, namely with teeth 718a (replacing the continuous rib 18a of Fig. 1) and the  
5 cone-shaped outer surface 718c.

The hybrid or composite structure of the ring 718 offers enhanced firm grip of the ring against the grooved pipe (not shown), as well as electrical short-cut between coupled pipes in case such is demanded.

The mounting ring 818 of Fig. 15 is produced not by plastic molding, but  
10 of sheet metal processed by known technologies (rolling) to the final shape. It will be noted that the continuous cone-shaped surface (denoted 18c in Fig. 2) is divided into two: portion 818c' and portion 818c" which together suitably support the inner cone-shaped surface of the mounting flange (not shown).

Those skilled in the art to which this invention pertains will readily  
15 appreciate that numerous changes, variations and modifications can be effectuated without departing from the true spirit and scope of the invention as defined in and by the appended claims.

## **WHAT IS CLAIMED IS:**

1. A pipe coupling for connecting a pipe (10; 110) to a flange (12; 112) associated with another pipe (16; 210) in a sealed manner, wherein the pipe (10; 110; 210) is formed with a circumferential groove (10a; 110a; 210a), the coupling comprising a gasket (20; 220), a mounting ring (18; 118; 218), and a mounting flange (22; 122; 222), characterized in that the ring (18; 118; 218) is elastically expandable, and formed with projection means (18a; 110a; 210a) adapted to fit into the groove (10a; 110a; 210a) and hold the ring affixed to the pipe (10; 110; 210) while the mounting flange (22; 122; 222) is tightened against both the ring (18; 118; 218) and a counter-flange (12; 222; 122).
2. The pipe coupling as claimed in Claim 1 wherein the ring (18; 118; 218) is split.
3. The pipe coupling as claimed in Claim 2 wherein the ring (18; 118; 218) is split by a cut extending in an axial plane thereof.
4. The pipe coupling as claimed in Claim 2 wherein the ring (418) is split by a cut extending in a non-axial plane thereof.
5. The pipe coupling as claimed in Claim 1 wherein the ring (18; 118; 218) is made of plastic material.
6. The pipe coupling as claimed in Claim 1 wherein the projection means comprise a circular rib (18a; 118; 218).



7. The pipe coupling as claimed in Claim 6 wherein the rib (18a) is of a generally saw-tooth shape having a right-angled side (18') and a beveled side (18a").
8. The pipe coupling as claimed in Claim 1 wherein the ring (18) is formed with a circular recess (18b) configured to accommodate an elastomeric gasket (20).
9. The pipe coupling as claimed in Claim 8 wherein the gasket (20) is formed with an inner slot (20a).
10. The pipe coupling as claimed in Claim 9 wherein the gasket (320) is formed with a thin flap (320b).
11. The pipe coupling as claimed in Claim 1 wherein the ring (18) has an outer cone-shaped surface (18c).
12. The pipe coupling as claimed in Claim 11 wherein the cone angle is between 15°-30° relative to the axis of the ring (18).
13. The pipe coupling as claimed in Claim 12 wherein an upright shoulder (18d) extends around the end of the cone surface (18c).
14. The pipe coupling as claimed in Claim 1 wherein the mounting flange (22) is formed with an inner cone-shaped surface (22a) matching the cone-shaped surface (18c) of the ring (18).
15. The pipe coupling as claimed in Claim 14 wherein the mounting flange (22) is formed with a series of bores (22b) through which tightening bolts (14) are adapted to pass.
16. The pipe coupling as claimed in Claim 11 wherein the bores (22b) are partly surrounded by arcuate projections (22c).

17. The pipe coupling as claimed in Claim 1 wherein the ring (518; 618) is composed of more than one segment, the segments being held together by an external elastic band (524; 624).
18. The pipe coupling as claimed in Claim 17 wherein metal inserts (826) are interposed between adjacent segments.
19. The pipe coupling as claimed in Claim 18 wherein the segments and inserts are held together by an elastic band threaded therethrough.
20. The pipe coupling as claimed in Claim 1 wherein the ring (818) is made of sheet metal.

## **ABSTRACT**

A pipe coupling for connecting a pipe to a flange associated with another pipe in a sealed manner. The pipe (10) is formed with a circumferential groove (10a). The coupling comprises a gasket (20), a mounting ring (18), and a mounting flange (22). The ring (18) is elastically expandable, e.g. by being split, and formed with projecting rib (18a) adapted to fit into the groove (10a) and hold the ring affixed to the pipe (10). The mounting flange (22) is tightened against both the ring (18) and a counter-flange (12), through matching cone-shaped surfaces (18c, 22a).